

W. W. Rudshau
to Dr. Henry Cushing
H. C.

HISTORY AND VALUE
OF
ANTISEPTICS;

TOGETHER WITH
REMARKS ON ANTISEPTIC DRESSINGS,

READ BEFORE
*THE SURGICAL SECTION OF THE SUFFOLK
DISTRICT MEDICAL SOCIETY,*

APRIL 7, 1886.

By ERNEST W. CUSHING, M.D.,
OF BOSTON.



BOSTON :
PRESS OF GROSVENOR & RICHARDS.
1886.

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MANUFACTURERS OF

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49 Federal St., Boston, Mass.

TO THE MEDICAL PROFESSION:

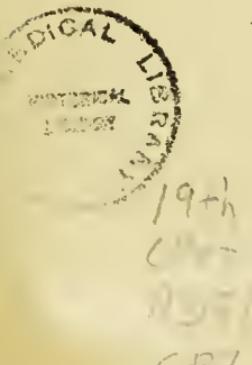
It is now upwards of twenty years since I gave up the practice of medicine, and devoted my time and energies to the making of Medicinal Plasters. Having been regularly graduated and had the experience of several years' practice, I was undoubtedly prepared, in the best manner, to understand that honest and reliable preparations were the ones which would meet the heartiest approval by the profession.

There are many of you who have, in a very friendly way, kept along with me in my efforts; giving me kindly-offered suggestions, and from time to time have sent me letters testifying your appreciation. The encouragement thus tendered has been very gratifying, and has been a wholesome stimulant.

For the future, as for the past, I can but say, I shall continue to give my personal attention to all goods offered by our house, laboring with care to attain a most complete line of Plasters, Surgical Dressings, etc.

Very truly yours,

J. M. GROSVENOR, M. D.



HISTORY OF ANTISEPTICS.

SOME fifteen years ago a benefactor of humanity, Joseph Lister, whose name should always be held in grateful remembrance, began that course of surgical triumphs which has astonished the profession and revolutionized the art.

Although with time his processes have been simplified, and improvements have been made, and although certain eminent operators, blinded by vanity, or eager to find grounds for criticism, seek to discredit the system, or to rob Lister of his laurels, yet the fact remains, that now men live who before Lister's system was developed must have died; now wounds heal easily, and without pus, which formerly must have healed, if at all, by long and miserable suppuration: now limbs are saved, pyæmia is avoided, abdominal section is rendered safe, puerperal inflammations are stamped out, great joints are freely opened, all in consequence of the revelation which was made to suffering humanity through Lister.

if a single cell divides in an hour, and each of its progeny continues so to subdivide. In a couple of days the number runs up into the hundreds of billions.

According to the form of the groups in which they occur, characteristic of each species and of the colors they assume, when bred in pure cultures, these germs are classified, according to the labors of Ogston, Rosenbach, and Passett, as follows:—

Streptococcus, or chain germs,
Staphylococcus pyogenes albus,
" " aureus,
" " citreus.

or white, golden, and yellow pus germs, occurring in clusters, like bunches of grapes.

Bacillus pyogenes fœtidus, or foul pus bacillus.

The first two varieties are perfectly round, about one-half of a mic. millimetre in diameter,—say one-fourteenth, more or less, of the diameter of a red blood corpuscle. The last kind is of the same width as the above, but the cells are perhaps twice to three times as long as they are wide. They give forth a foul odor in growing, the well-known smell of stinking pus.

All these grow with great rapidity, and they exist in nature outside the body. We know them best as found

in wounds, and here they flourish exceedingly. They are not killed by simple drying, and so can be wafted about, as dust, and thus enter wounds. Far more frequently, however, they do not come in from the air, but are directly imported by the agent causing the wound, or by the probe, fingers, or instruments of the operator. They feed on the albuminous secretions of wounds; they either break these up in such a manner as to form poisonous compounds, or they actually secrete poison of a most virulent nature, which, when absorbed in the system, gives rise to the chill and fever and other symptoms of septicæmia. Their presence causes pus to be formed.

If there is a fair chance for the pus which contains them to escape as it forms, their injury is usually only local. If they are pent in, or rudely forced into the lymphatics or blood-vessels, they may, and often do, infect the whole system, forming deposits in various organs, where they continue to grow. These local colonies likewise lead to the formation of pus, and thus arise the well-known metastatic abscesses of the dreaded pyæmia.

The formation of pus is a conservative effort of nature to expel the intruders. The white cells leave the vessels, and migrate in the tissues toward the point of infection, shutting out the invading germs by a living wall which bounds the resulting abscess, and, in favorable cases,

killiug the germs outright by action of the living pus-cells. With streptococci, however, this is often more difficult than with the other forms. Thus, diffuse cellulitis, blood-poisoning, and fatal septicæmia frequently follow the inoculation of streptococci. The latter are the germs found in erysipelas—at least, they are just like them. They are also found in rapidly fatal cases of puerperal fever, which is apparently only a general name for the inoculation of the puerperal uterus with the various germs above mentioned.

These organisms do not exist in the blood of healthy persons. They are introduced into wounds *from without, always.*

Without germs there is no acute suppuration: only an exudation of serum, with perhaps a few white cells; nothing that would ordinarily be called pus.

These germs, with perhaps one or two other varieties, are, then, the cause of all the trouble following wounds and operations; and the whole problem of antiseptic surgery is to keep them out, to kill them if they get in, and to allow free exit from the wound to such as may not have been killed.

They are killed by dry heat 250° F., by steam, by water at the boiling-point, and by various drugs. Of the latter, practically the most useful are corrosive sublimate

(1 : 1000, or weaker down to 1 : 10000), carbolic acid (3 per cent), iodoform.

Antiseptic surgery requires that every thing that comes near the wound should be perfectly free from germs, — fingers, instruments, needles, catgut, drainage-tubes, sponges, coverings, bandages, etc. Nothing is really satisfactory as a means of cleaning the fingers, except corrosive sublimate ($\frac{1}{1000}$); but for instruments, carbolic acid ($\frac{1}{30}$) is efficient. They should be immersed in the solution for a half-hour before the operation.

The skin of the part to be operated on is to be soaped, shaved, and scrubbed with a nail-brush with 1 : 1000 corrosive-sublimate solution.

During the operation the wound is to be well doused with a hot corrosive-sublimate solution, from 1 : 2000 to 1 : 5000, according to the surface exposed and the length of the operation. The fluid runs off on a rubber sheet into a pail. The surrounding parts should be covered with towels wrung out in the same solution. Absolute accuracy is essential in every detail. The assistant who hands any instrument must have disinfected his hands as above; nothing must be dropped on the floor, or rubbed on the table or clothes. The sutures of catgut will be absorbed in the wound. The dressings need only be changed once to remove the drainage-tube; and

if a tube of decalcified bone (such as manufactured by Grosvenor & Richards) has been used, that also will be absorbed. He who will learn the system, and carry it out in its details, will be well rewarded in the splendid results he will obtain: he who will not do so, has no right to practise — or, rather, malpractise — surgery.

Something can be learned from the excellent works on the subject now extant: but the true way to learn is, to go to the nearest hospital where the system is fully carried out, and see the details, observe the results, acquire a faith that will remove mountains; then the books and papers are of some real value in putting one in mind of what he has seen, but might forget.

For all this work various antiseptics are necessary; and the profession is fortunate that the preparation of these has now become a specialty with Grosvenor & Richards of Boston and New York, manufacturers of Surgical and Medicinal Plasters, Antiseptics, and Absorbents. The expense is considerable in applying permanent dressings thoroughly; but if a wound has only to be dressed two or three times, instead of ten times as often, it is a wise economy of time and money to use the best, to say nothing of the diminution of the suffering of the patient, and the gain in time.

Certain things, then, the surgeon must have besides a

supply of the three drugs above mentioned, and of prepared catgut, drainage-tubes, etc. He must have some form of dressing that will absorb discharges, but will not let them serve as a nest for germs.

Such a dressing is absorbent cotton gauze or cheese-cloth, or absorbent cotton wadding, impregnated with iodoform ($\frac{1}{20}$) or carbolic acid, with resin, etc., or corrosive sublimate (1:1000). In these the wound is incased with the utmost care; and in nothing is the old motto truer than here:—

“Safe bind, safe find,—

A maxim never far from prudent mind.”

The principle on which wounds are closed is always the same, the details varying with the nature of the injury or operation.

Briefly: All microbes must be washed out of the wound, hemorrhage must be stopped, and all blood or other foreign substances removed, before the wound is closed.

Provision must be made for the escape of some serous exudation by tubes of rubber or bone, or by strands of catgut. The parts must be exactly coapted, and, as a rule, sutured by some material capable of being absorbed, and set completely at rest.

The skin round the wound for some distance must be made impassable for colonies of microbes growing along the surface from outside the dressings.

A mass of highly absorbent material must envelop the parts so prepared with antiseptic substances as to prevent the decomposition of any serous discharges which may occur, able to keep up an even temperature, and so arranged as not to become dry too quickly, so as to stick to the wound, and dam in the serum, nor yet too wet, so as to let the latter run through.

In short, the operator must thoroughly and efficaciously believe and realize, that, without the presence of bacteria introduced from without, there will be neither suppuration nor any of the graver wound-diseases which have been the terror of surgeons and the plague of their patients from time immemorial.

Primary union without suppuration is what the surgeon should now look for, and what the patient has now a right to expect, as the rule. Any thing less savors of failure. A treatment that gave what were considered good results ten years ago, would now be very like malpractice.

REMARKS ON ANTISEPTIC DRESSINGS.

AT the last meeting of this society I related certain experiments which I was performing with hydronaphthol, which certainly showed, that, in the strength of about 1 : 1100, this substance has a power of preventing the development of various putrefactive and pyogenic bacteria in urine and in gelatine tubes. This confirms the claims made for it, and the results of the experiments of Dr. Fowler, to this extent.

On the other hand, however, hydronaphthol appears to have no power of killing bacteria, but merely prevents their development. The gelatine in tubes which I showed you last time, containing 1 : 1100 of hydronaphthol, and infected with various bacteria, remained solid and transparent, and are still so. The urine has also not become decomposed; but, on adding a little of the gelatine to another culture tube containing gelatine but no hydronaphthol, the various bacteria developed actively.

The claim made, that hydronaphthol is twenty times as strong as carbolic acid, is therefore true only in a one-sided way. In a solution of 1 : 1100 it will do fairly well the work of carbolic acid 1 : 50, but not so safely, in my opinion. As it is not readily soluble in cold water, however, it cannot be used in greater strength than as above; whereas carbolic acid can be readily increased to three or four per cent, when it has a certain germicidal action. In a limited way, therefore, hydronaphthol has uses in preserving sponges, etc., already safely disinfected by sublimate or boiling, as pointed out by Dr. Fowler. These powers are similar to those of napthol and of naphthaline, to which last I called the attention of the medical society two years ago. As hydronaphthol is no proper chemical name, I wrote to the manufacturers to learn the chemical formula; but, receiving no answer, I am forced to conclude that it is not a matter of public information. It appears to resemble very closely alpha napthol, but I have not felt it worth while to pursue the examination farther until I know with what I am dealing.

I see nothing in it which will induce me to abandon such well-tried antiseptics as carbolic acid, sublimate, and iodoform. By the proper use of these, or even of boiling water, which is the oldest and surest of all the germicides, we are able to get such results as our fathers never

dreamed of, and which ten or fifteen years ago seemed mythical. It is not merely in the great operations of great surgeons, laparotomies, resections, etc., that antisep-
tic dressings come into play ; but in the daily work of the general practitioner, in minor surgery, in obstetrics, in ordinary gynecology,—in every thing, in fact, involving a possibility of infection,—the use of such dressings is an inestimable comfort to the surgeon, and a source of safety which the patient has a right to expect.

As it is very convenient to be able to purchase such things in small quantities and handy packages, and as most of them are very annoying to make at home with reasonable accuracy, I have felt that the society would be interested in seeing these samples, made by *Grosvenor & Richards* of Boston and New York, which are submitted for your inspection and criticism. I will also show you one or two appliances of my own devising, which, at a small expense, may prove a convenience for those who wish to be precise in their antiseptic work.

First, I show you a tin can, containing a pound of *Grosvenor & Richards's* tarred jute, a sort of idealization of our old friend, oakum. This is very soft, a long, even fibre with no knots or lumps, and is, as I understand, especially prepared for a surgical dressing ; it is reasonably absorbent, for all its tarriness, and is a capital thing

to put above the more strictly antiseptic dressings over a wound, as it permits of the use of an even pressure, absorbs the moderate discharges which we expect nowadays, and keeps the air from the wound, and the smell of iodoform, if any has been used, from continually passing out into the air.

Here is also clean oakum in small paper packages, very convenient for carrying about or keeping out of the reach of dust.

Grosvenor & Richards's absorbent cotton, plain, and also salicylated, borated, and treated with corrosive sublimate, are here in handy packages. For use in gynaecological treatment, the last two are very convenient: the borated for tampons to be used plain, or with boro-glyceride, as recommended by my friend Dr. Wylie; the sublimated for wiping up secretions from the vagina, or, moreover, for use about wounds, instead of sponges.

A plain absorbent gauze or cheese-cloth, as here shown, is very convenient to put above other dressings, and also is the basis of the preparation of the carbolized and iodoform gauze which I also have here. As I understand it, the cloth at one stage of its manufacture is in this condition after bleaching and before sizing, so that by the piece it is cheap. For bandages, and especially for plaster-of-Paris bandages, cotton cloth thus made absorbent is very convenient.

Perhaps the most important of these preparations is iodoform gauze, made from the above by thoroughly dusting and rubbing it with iodoform, and put up by Grosvenor & Richards in tin cans of five yards each. This gives about twenty per cent of iodoform; and this mode of preparation is much cheaper than, and, as it seems, equally efficacious with, that of soaking the gauze in a ten per cent solution of iodoform in ether and alcohol. Dr. Newell assures me that this is the mode of preparation now adopted in Billroth's clinic, although last year I there saw that prepared by soaking as above.

I observed that Billroth never used iodoform except in the form of gauze. As I was told, this was on account of some severe cases of poisoning from this agent which had occurred when it was used, with what seemed proper care, in the form of powder.

A more admirable preparation for stuffing a cavity after an operation on bone, etc., or for laying over a wound, it is hard to imagine; and the beautiful results obtainable when a wound has been kept aseptic are a continual joy to the surgeon.

Dr. Newell also tells me that Billroth employs, for use about mucous membranes, a stronger preparation, even to fifty per cent of iodoform, made by rubbing the latter into gauze treated with resin on paraffine, etc., as I shall shortly describe.

The great source of safety in using this substance in gauze instead of powder is, that only a little is ever in contact with an absorbing surface, so that poisoning is impossible: but yet all secretions have to pass through it, and are kept aseptic; while, on the other hand, all putrefaction or infection approaching the wound is rendered harmless before the bacteria can enter the latter.

Iodoform gauze is very easily made at home in very small quantities; and for some purposes absorbent cotton, well dusted with the powder, or shaken in a large tin can with the latter, answers very well: but for large quantities, the vile odor of the drug is enough to deter most men from trying to make it at home.

Carbolized gauze, however, can be made at home by any one who will take the necessary time and trouble; but it is not so easy as one would think to turn out so nice an article as I here show you of *Grosvenor & Richards*. It is, like the other gauzes, conveniently packed in a tin can, which keeps it clean, and prevents loss of the antiseptic.

I show also a specimen of carbolized gauze, home-made — from absorbent cotton, resin, paraffine, etc., and carbolic acid, according to Lister's formula — by Dr. Marcy.

The process is somewhat troublesome, owing to the heat required to melt the resin; and I think that those

who have hitherto been used to make it at home will welcome this reliable preparation made after the same formula by Grosvenor & Richards.

These preparations of carbolic gauze are very soft, sufficiently absorbent, and make an admirable dressing for wounds. It is well, just before applying, to sprinkle and rub with iodoform powder the surface of the gauze next the wound, making a dressing something like Billroth's, except that in his strong iodoform gauze there is no carbolic acid, but the whole mass is impregnated with iodoform.

Under such a dressing, after an operation performed (as are all our operations except in the abdomen) under irrigation of a hot sublimate solution, there is very little fear of suppuration.

In this connection I show you two appliances of my own devising, which serve a double purpose, both being useful in the cultivation of bacteria, and also in preparing the above dressing, and in operative antiseptic work. They are a steam sterilizer and one to act by dry heat.

The steam sterilizer of Koch is large and heavy, covered with felt, and, as manufactured in this country, costs twenty-five dollars. It is an admirable thing for constant use in a great laboratory; but the felt is in this country subject to the attacks of moths, and for private use it is

rather expensive. I have therefore devised this simple sterilizer, which can be made by an expert tinman for about two dollars.

It is a stout tin pail seven inches in diameter and nineteen inches high.

Inside are two perforated tin diaphragms, removable, at five and twelve inches respectively from the bottom. The cover fits snugly, and is perforated for a thermometer.

Outside the pail is a sleeve or jacket of tin, one inch larger in diameter, open at the bottom, and joined to the pail at the top by a flange which fits snugly without being soldered. The flange is "much perforated" with holes about half an inch apart. The whole fits on an ordinary gas or oil stove, and holds water enough to boil for about two hours and a half without replenishing. The heat, passing up on all sides inside the jacket, secures an even temperature; and the closely fitting cover permits a temperature of 214° F. or thereabouts.

There is room to hold a one-litre flask, with a large funnel in it, for preparing gelatine; thus dispensing with a hot-water funnel. When once raised to the boiling-point, it will remain so with a very small flame under it.

Although originally intended for sterilizing gelatine, etc., in flasks and tubes, it is very useful for disinfecting

sponges or bandages. It is light and portable, and small enough to have in an operating-room; and I can recommend it to those who do not like to use antiseptics, but wish to be very sure that their sponges are safely disinfected.

It is much easier to pluck a sponge hot and nearly dry out of this than to fish it out of boiling water, and squeeze it when hot. If there is any one thing sure about disinfection, it is, that freely streaming steam will surely kill all septic germs; and by starting this sterilizer, holding the sponges, an hour or so before an operation, one great source of danger is removed.

The other appliance which I show you is a substitute for Koch's double-walled dry-heat sterilizer, costing in this country fifteen dollars.

This is simply an oil-stove oven with double walls, costing, complete, two dollars and eighty-five cents. In the top, near the back, is a tube, passing through both walls, to carry a thermometer.

Remembering that cotton will not stand a temperature above 300° F., this can be used for rendering compresses, towels, absorbent cotton, etc., aseptic; and thus dressings can be prepared during or just before an operation, and be used with every certainty of security. Instruments can be sterilized in the same way.

Of course, the original purpose of Koch's dry sterilizer is to prepare glassware, plates, tubes, instruments, etc., for bacteriological work; and I have presented these cheap and reliable substitutes in the hope that surgeons may be led to take personal interest in such work, not being deterred by the difficulty and cost of procuring foreign apparatus. Nutrient gelatine in test-tubes can be bought now in this country.

Of course, few can be experts in bacteriology; but I think that every surgeon should have some familiarity with the *technique* of the various procedures. Thus alone is he likely to learn and appreciate the minute attention to details essential to success in antiseptic surgery, and to use the same care and precautions in operating on man which he has learned to employ in inoculating a rabbit.

To return to the preparations of Grosvenor & Richards, I have here catgut in four sizes, on glass spools, on a wire, in a bottle of carbolized oil, and another set in a bottle of oil of juniper, as used in Schroeder's clinic. These are also prepared with a ground-glass stopper and glass rod; but for carrying about in a bag, I think the first form is preferable.

If desirable, a couple of needles can be stuck in the cork on the inside; and, thus equipped, it furnishes one

more useful article for that capacious and ever-increasing receptacle,—the “obstetrician’s bag.”

The man who has something on hand to quickly and safely sew up a bleeding laceration of the cervix, or a ruptured perinaeum, will not only help his patient, but avoid much blame in these modern and critical days.

I will not detain you by describing the convenient forms in which I show you drainage-tubes of rubber and of bone, nor in calling your attention to the various neat and handy spools carrying an admirable braided silk for sutures or ligatures, all ready to be immersed in a disinfecting solution. The various plasters for which Grosvenor & Richards have earned an honorable reputation, you can see and examine for yourselves, although they have nothing in particular to do with antiseptics. My object has been, to bring these various articles to your notice, hoping that they may prove of interest, and that you may see what is being done in our own city in furnishing reliable antiseptic appliances.

HOTEL PELHAM, BOSTON.

FROM BELLEVUE COLLEGE, THE LARGEST HOSPITAL IN AMERICA.

BELLEVUE HOSPITAL, } NEW YORK.

We, the undersigned House-surgeons, have used the "AMERICAN SURGEONS' ADHESIVE PLASTER" in our wards for the past few months, and have found it superior to the Adhesive Plaster furnished for our use from the factory of Seabury & Johnson.

F. S. GOULD,
House Surgeon, 1st Division.
CHAS. E. QUIMBY,
House Surgeon, 2nd Division.
W. D. McKIM,
House Surgeon, 4th Division.

We, the undersigned Senior Assistants, endorse the above, and also desire that this plaster be supplied for hospital use.

MATTHEW D. FIELD.
1st Surgeon.
W. C. GORGAS,
2nd Surgeon.

STATE OF NEW JERSEY, OFFICE OF SURGEON GENERAL.

JERSEY CITY, N. J.

This is to certify that I have used the "AMERICAN SURGEONS' ADHESIVE PLASTER," and consider it the best in the market.

THEODORE R. VARICK, M. D.,
Surgeon to St. Francis and Jersey City Charity Hospitals.

291 MADISON AVENUE, } NEW YORK.

I have used the "AMERICAN SURGEONS' ADHESIVE PLASTER" as manufactured by GROSVENOR & RICHARDS, and have found it entirely satisfactory.

ALFRED C. POST, M.D., L.L.D.
Visiting Surgeon to Presbyterian Hospital, &c., &c.

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